UNIVERSITY PROSPERITY GAME

PLAYERS' HANDBOOK

April 4 - May 2, 1995

prepared for the
University of New Mexico
Anderson School of Management
MGT 508
Ethical, Political, and Social Environment of Business

produced by
Sandia National Laboratories

UNIVERSITY PROSPERITY GAME

for
ETHICAL, POLITICAL, AND SOCIAL ENVIRONMENT OF BUSINESS
(MGT 508)

April 4, 11, 18, 25, and May 2, 1995

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Game Objectives

This is the ninth Prosperity Game that has been conducted. The objectives of all these games have been to:

- Stimulate thinking;
- Develop relationships and partnerships among industry, government, labs, universities, and public groups;
- Explore long-term strategies and policies;
- Lay the foundation for industrial roadmaps; and
- Provide informed input for possible future legislation.

This game is being held in conjunction with the Anderson School of Management at the University of New Mexico. This Prosperity Game was initially designed for the roadmap making effort of the National Electronics Manufacturing Initiative (NEMI) of the Electronics Subcommittee of the Civilian Industrial Technology Committee under the aegis of the National Science and Technology Council. It has been modified to support course material in MGT 508, Ethical, Political, and Social Environment of Business. In this context its main objectives are to:

- Introduce and teach global competitiveness and business cultures in an experiential classroom setting;
- Explore ethical, political, and social issues and address them in the context of global markets and competition; and
- Obtain non-government views regarding the technical and non-technical (i.e., policy) issues developed in the NEMI roadmap-making endeavor.

Game Scenario and Roles

This game has been designed for approximately 31 players, with four team and 19 individual roles, as shown in Figure 1. The teams represent the executive management committees of each of four companies and are composed of three players each. The individual roles primarily reflect the government and public sectors including various legislative and agency (or ministry) officials, laboratories, universities, finance, the media, and the customer/taxpayer, both in the US and Japan. General descriptions of each role and the specific issues and decisions facing those roles are given in a subsequent section of this handbook. Detailed information for each of the companies and government roles is given in Appendix B.

As in life, business combines interactions with companies, government agencies and officials, and members of the public and private sectors. Each of these roles faces many ethical, political, and social issues in the course of its dealings, in addition to the financial and competitiveness issues traditionally associated with the business world. This game has been designed to explore many of these interactions with you playing the roles.

A centerpiece of this game is an imaginary electronics product called SAMSON, a high-tech personal communicator/entertainment/computer device. A first-generation SAMSON device is being developed and manufactured or imported by two large companies, one US and one Japanese. Two other smaller companies, one US and one Japanese, are suppliers to the larger companies.

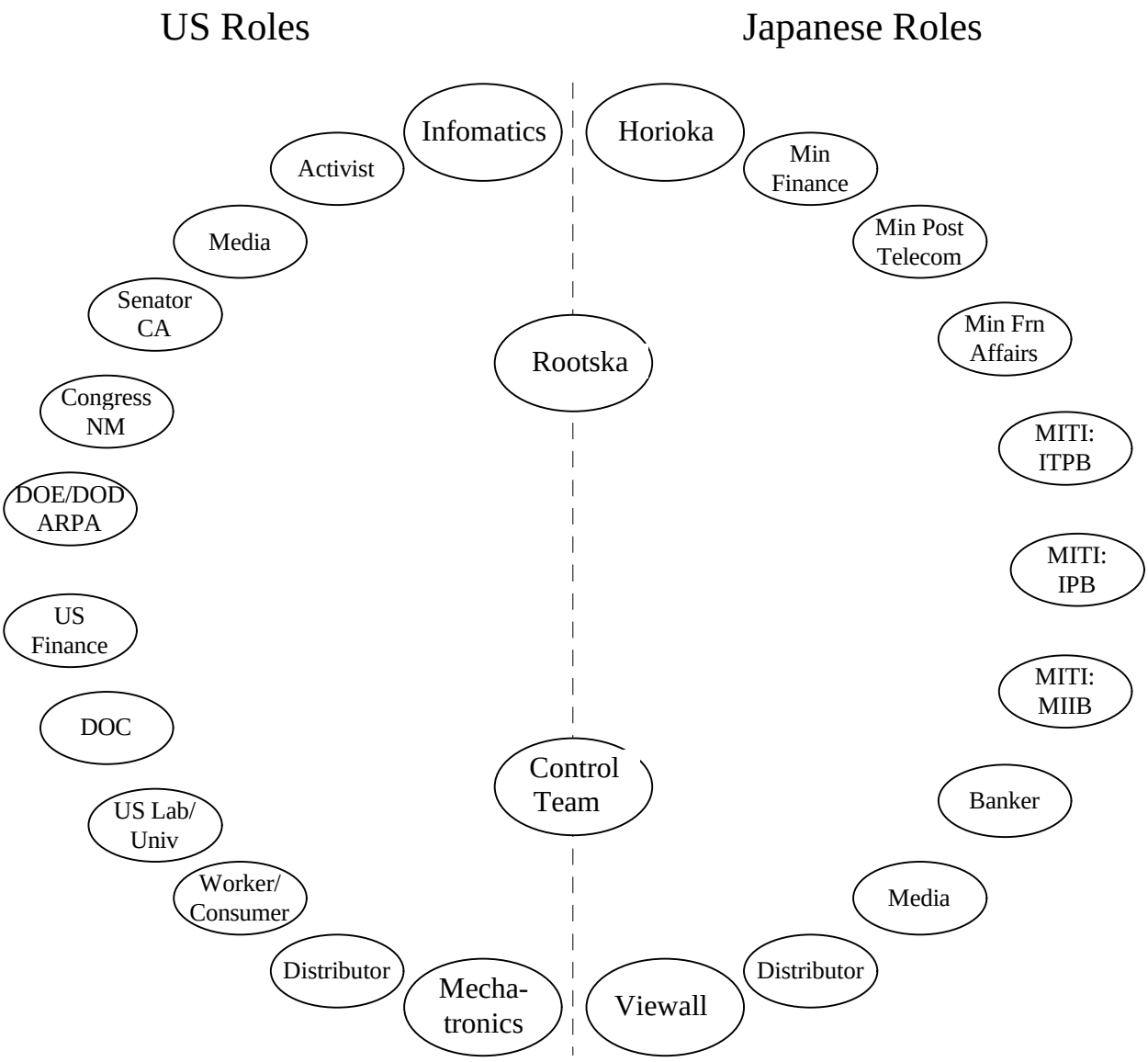

Figure 1. Roles: Teams and Individuals

For company roles, assume that intra-company issues have been delegated to subordinates so your work guides the company as a whole. The actions of each team are subject to the discipline of a working consensus; i.e., every member of the team can live with the corporate consensus position and no member of the team can do anything that is unacceptable to any other member of the team. Therefore, it is not necessary (but is allowed) to establish manager-subordinate roles within teams.

Game Outline

The general game outline and flow are as follows. Each participant is assigned a role, some to teams, and some as individuals. Each should read the handbook thoroughly to develop

an understanding of all the roles and a detailed understanding of your assigned role, issues, and potential interactions.

Preparatory to the start of play each team or individual should take some time to define objectives for the future, i.e., ask the question "Where should this individual or company be in five or ten years?" After defining the objective, a strategy and potential moves to reach the objective should be formulated. This may include planned interactions and negotiations about products, finances, ethical and moral issues, politics, etc. The brief descriptions for each role contain current issues that require decisions. Supplementary material for each of the company teams and government officials is available in Appendix B. Written statements of your decisions and the reasoning behind them will be required. In addition, you will be required to keep a game journal into which you should enter your interactions, reasonings, and any insights gained. You must keep and hand in this journal to receive a grade for the Prosperity Game portion of the course.

After strategies are defined, play begins. Play consists of interaction between roles to bring about the objectives you defined for your role before the start of play. This may be done both in and out of the classroom setting. In fact, interaction between scheduled class periods is essential and will allow you to reach your objectives more readily. An equally important element of play is investment in Toolkit options.

Technology and Policy Toolkit

The Electronics Subcommittee (ESC) is working on a roadmap for the electronics industry through the National Electronics Manufacturing Initiative (NEMI). The roadmap has both technology and non-technology (policy) elements. Technology elements provide opportunities for investment to enable potential upgrades or breakthroughs in technology, while policy elements are suggested changes that are thought to enable increased competitiveness. The Toolkit employed in this game reflects a subset of the options examined by the NEMI Roadmap Framework Committee. The purpose of the Toolkit is to examine the potential effects of many of these options in the context of simulated but real-world industrial and government policies and actions.

In research, as in life, success defined as reaching the desired outcome, is never assured beforehand, regardless of the resources allocated; a desired outcome cannot be bought outright. However, we will assume that the probability of success increases with an increase in the resources allocated. For the Toolkit, success or failure (achieving or not achieving the desired outcome) of each option is determined using a normal cumulative probability distribution based upon the amount of money invested. The standard deviation for the distribution is set at one-half the mean, and the mean (50% probability of success) for each option has been assigned by the Control Team. The Control Team is the control team running the game.

Figure 2 shows a normal cumulative probability distribution with mean of $100M and standard deviation of $50M. In this example, an investment of $100M would yield a success probability of 0.50; an investment of $150M would yield a success probability of 0.84; an investment of $200M, twice the mean, would result in a probability of almost 0.98. Success or failure is then determined by generation of a random number between 0 and 1. If the random number is less than the investment probability, the option succeeds;

otherwise it fails. When a Toolkit option succeeds, its immediate effect will be estimated by the Control Team and will be relayed to all roles that are affected by the change.

In the detailed descriptions of your roles, you have been assigned total initial resources (dollars) that are proportional to your total current assets. These funds can be invested in Toolkit options, business deals, R&D investments with other companies or national labs, purchasing patents and rights, etc.

However, for investments in Toolkit options only, the initial capital of the two small companies and the government officials have been increased by an *influence* factor (see Appendix A). This factor simulates the relatively larger influence that governments and smaller companies can exert on policy changes than would be expected only from the assets assigned to those teams. Additional money can be raised by borrowing from the Control Finance Team; those funds are not increased by the influence factor. The list of Toolkit options and the investments required for a 50% probability of success are given in Appendix A.

SAMSON - Product Description

The game scenario focuses on an imaginary electronics product called SAMSON, a high-tech personal communicator/entertainment/computer device. Although a current version of SAMSON exists, the final lightweight, portable advanced product will require hundreds of millions of dollars to commercialize. The current product is being developed and manufactured or imported by two companies, one US and one Japanese. The SAMSON product also has military applications and is viewed by the US Administration as being strategically important. The product is in the middle stage of development, but several key technologies need major innovation for the advanced technology to be successfully commercialized.

SAMSON is a spin-off of a military global battlefield communication device. The military product is currently very expensive and has limited capability. The ultimate consumer product is envisioned to have full color 3-D displays, bio-sensor interfaces, voice and pattern recognition, global communications, global positioning/location, video and audio links, remote banking, etc. The current product is limited by weight and power consumption, has a B&W 3-D display, and no bio-interfaces. Additionally, a large investment in artificial intelligence (AI) software will be required (approximately $100M is estimated). The key technical challenges are in software, human interfaces (tactile feedback, displays/sensory inputs), color displays, and low-power peripherals and mass storage devices.

The US Administration is about to submit its budget request for the next fiscal year and is willing to consider financial support to SAMSON-type projects, but is uncertain what the best financial levers are; it has requested corporate input and a 5-year technology development/commercialization plan. The US Administration must work within severe budget constraints as well as new treaties such as GATT and NAFTA. The Japanese government requires similar information and has similar constraints.

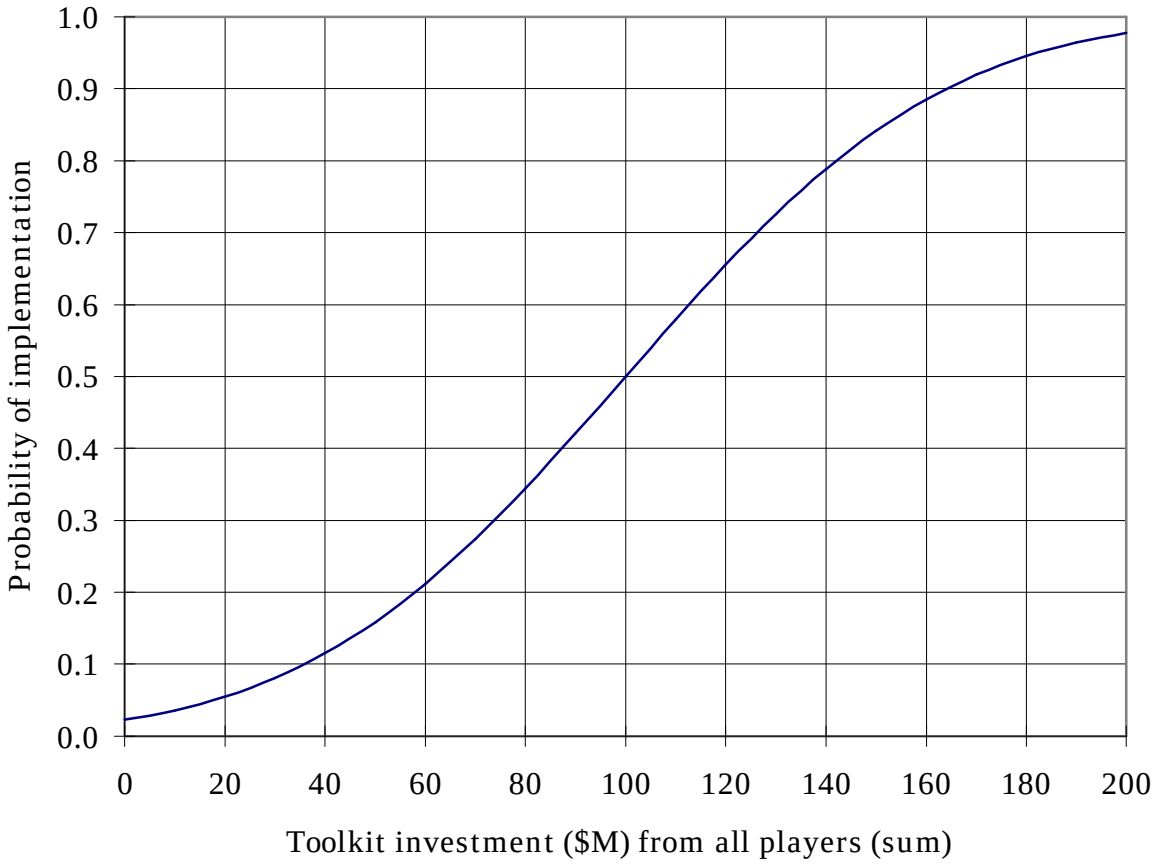

Figure 2. Toolkit options let your team influence the game in accord with your strategy.

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Schedule for Tuesday, April 4, 1995

7:30 pm Introduction to the topic of competitiveness
8:30 pm Briefing on Japanese business culture, etc., by Manabu Eto
8:50 pm Inbriefing to the Prosperity Game with questions and answers
Players' Handbooks distributed.

9:30 pm Class dismissed.

Activities outside of class to be completed before the beginning of the following class period:

Purchase reading packet from Alphagraphics on Lomas.

Read and digest the introductory readings.

Read and understand the Players' Handbook.

3:00 pm Sunday, April 9, 1995. Role assignments will be distributed by Email.

Read and understand the detailed information about your role from Appendix B of the Players' Handbook. Begin formulating strategy and priorities if you desire.

Begin your journal.

Schedule for Tuesday, April 11, 1995

7:00 pm *Game time is Year 1995.*
Determine the nature, financial and technical condition, assets, liabilities, and goals of your individual or team role. Understand the nature of other roles that affect your role's future. Develop a set of strategic objectives consistent with your role and the culture of your country. Determine negotiation priorities to advance your strategy.

Review Challenges and Options facing your role as described in the Players' Handbook. Develop a set of priorities.

Determine the Technology and Policy Toolkit Options that you wish to advance with your initial budget allocations. You may also invent options of your own (limit of one per role). The Control Team will estimate the 50% probability cost of any invented options.

8:00 pm **Players submit strategies and priorities including reasoning to the Control Team in writing.** Finalize budget allocations for Technology and Policy Toolkit options. Teaming together on allocation of is encouraged.

Open negotiations between all individuals and teams are allowed. Deals are made. Form groups and alliances as you feel necessary. Any formal agreements must include date, time, and the signatures of a designated team member from each party; agreements are reported to the Control Team for tabulating of financial commitments. Public posting of each deal is preferred, but optional.

8:30 pm **Individuals and teams submit initial Toolkit budget allocations to the Control Team.** Control Team tabulates toolkit options and calculates successes and failures based on probabilities. Note: Toolkit allocations may be submitted any time from this time until 8:30 on Tuesday, April 18.

9:00 pm *Game time is Year 1997.*
Results of Toolkit options are given to all players. Control Team provides revised estimate of SAMSON market (based on probabilistic estimates) and any other relevant information.

Open negotiation to advance strategies continues.

9:30 pm Class dismissed.

Suggested activities outside of class to be completed before the beginning of the following class period:

Read articles assigned by the instructor.

Continue your journal.

Open negotiation outside the classroom between all individuals and teams is encouraged.

Agreements made during the week may be submitted to the Control Team by E-mail. Any agreements submitted by 8:00 Monday morning will be reflected in the update given at the beginning of class Tuesday evening. Agreements submitted after that time will be reflected in subsequent updates.

8:00 pm Monday, Apri l 17, 1995. Scenario update will be distributed by Email.

Schedule for Tuesday, April 18, 1995

7:00 pm **Individuals and teams submit any new agreements to the Control Team for review.** Open negotiation to advance strategies continues.

7:30 pm *Game time is Year 1999.*
Control Team provides revised estimate of SAMSON market (based on probabilistic estimates) and any other relevant information.

8:00 pm Control Team revises scenario (with new technology and policy events).

Individuals and teams determine impact of revised scenario. New plans are developed. New agreements or revisions of previous agreements are discussed. Toolkit options are reconsidered in light of the revised scenario.

8:30 pm **Final Toolkit investments are submitted to the Control Team.**
Open negotiation to advance strategies continues.

9:00 pm *Game time is Year 2001.*
Results of final Toolkit options are given to all players. Control Team provides revised estimate of SAMSON market (based on recent agreements and Toolkit successes and failures) and any other relevant information.

9:30 pm Class dismissed.
Continued negotiation outside the classroom is encouraged.

Continue your journal.

Agreements made during the week may be submitted to the Control Team by E-mail. Agreements will be accepted until 8:00 am Monday morning.

All individuals and teams prepare 3-5 minute briefing to share with entire class. This briefing should focus on lessons learned, insights gained. Teams should designate one spokesperson to present the information.

8:00 am Monday, April 24, 1995. GAME ENDS. Negotiations cease.

Schedule for Tuesday, April 25, 1995

7:00 pm Control Team provides final balance sheets to individuals and teams.

7:10 pm Student debriefing.

9:15 pm Debriefing ends. Students enter final comments and insights gained into their game journals.

9:30 pm Class dismissed.

Schedule for Tuesday, May 2, 1995

7:00 pm Control Team debriefing of lessons learned and final outcomes.

8:00 pm End of Control Team debriefing. Wrap-up by Professor Logsdon.

BRIEF DESCRIPTIONS OF ALL ROLES

Infomatics Inc. US end-product manufacturer of electronics and computers for the information age

Infomatics is a leader in sales of high-tech personal computers, entertainment and communication devices. It is pioneering, in the US, a new class of devices utilizing virtual reality concepts, global positioning and world connectivity (generically called SAMSON). Infomatics had $3B in sales last year with profits of $200M and invests $300M annually in R&D. It has a US Government contract totaling $3M, annually, to develop advanced displays and other bio-interfaces.

Infomatics assembles 30% of its products on-shore. Four years ago it was forced to heavily automate assembly and has invested $75M in robotics for assembly. This equipment is in need of a major up-grade. Some of the best automation equipment for assembly is manufactured by its direct competitor, (Horioka, Ltd., a Japanese company with 40% market share of early SAMSON devices, in comparison to your 45% market share). A key component, namely 3-D displays, are manufactured exclusively by Viewall, Inc., another Japanese company. Infomatics owns key patents and intellectual property in software and architecture. These key patents have been licensed to Horioka to obtain these high-tech robotics. These license agreements with the Japanese competitor, Horioka, are due to expire in 18 months.

The Infomatics research department has been working on advanced 3-D displays with an annual budget of $15M. Infomatics has some good technology, but cannot keep up with the $100M R&D in displays being spent by its competitors. Infomatics has submitted several white papers for government funding of its display technology and may shut down the operation if no federal funding is obtained.

Key challenges are:

1) Advanced automated assembly and packaging
2) Better display technology
3) Better software
4) Location of production
5) Activists demanding zero emissions in California plant

Horioka, Ltd. Japanese end-product manufacturer for electronics, computers, and electronics manufacturing equipment

Horioka Ltd. is a major supplier of these high-tech, SAMSON entertainment/communication devices with 40% market share. Its factories are highly automated, utilizing equipment developed internally. Horioka is a large diversified $10B company. Last year, sales of SAMSON products totaled $40M and company executives expect new SAMSON sales to exceed $500M within 3 years of their introduction. Horioka invests $400M annually in electronics R&D. It has license agreements with Infomatics for elements of SAMSON which cover only the first generation, and is developing new technologies to circumvent the patent issues. However, the Infomatics-proprietary operating system

leaves Horioka with little choice but to negotiate a new license agreement, or try to introduce a new operating system which may not have wide acceptance.

Horioka has obtained the patent rights in the past, due to its strong position in automated assembly. Horioka's high levels of automation allow it to manufacture products at a lower cost with higher profit margin than Infomatics. This automated assembly equipment is manufactured and sold worldwide by Horioka's Advanced Automation Division, which supplies automation equipment for the semiconductor and electronics industries with annual sales of about $700M.

Horioka is also a manufacturer of CPU's and DRAM's. Horioka purchases 3-D displays from the same Japanese company (Viewall, Inc.) as Infomatics. Horioka is a member of the same major keiretsu organization that the Japanese bank belongs to.

Key challenges are:

1) Advanced automated assembly and packaging
2) Better display technology
3) Better software
4) Location of Production
5) Accused of illegally obtaining state-of-the-art robotics design software from a small US firm

Mechatronics, Inc. US manufacturer of automated manufacturing equipment

Mechatronics' business is automated assembly of printed circuit boards and automated wafer handling. It also supplies some robotics to the automotive industry. Additionally, it has developed some automated advanced packaging equipment but has seen few sales. Mechatronics has total annual sales of $75M, but its sales position has been slipping dramatically. Its' management hopes these new advanced packaging and robotic assembly tools will help them regain some lost business. However, even though SEMATECH has declared that Mechatronics' advanced packaging tools are the best in the field, they are still viewed as inferior to those available off-shore. Mechatronics has a $1M R&D program with SEMATECH to develop advanced robotics, and a $400K ARPA contract on CAD/CAM simulation and software development. Although Mechatronics has several R&D efforts which could have significant impact on its business, it lacks the capital to implement them.

Mechatronics has proposed establishing a manufacturing/user consortium for the development and manufacture of advanced robotics. Additionally, it has approached Infomatics about a joint development program.

Key challenges are:

1) Financial troubles
2) Technology development

Viewall, Inc. Japanese display manufacturer

Viewall, Inc., manufactures 95% of the world's 3-D displays for which Viewall and MITI have invested $250M in their R&D. Viewall is currently selling without prejudice to all US,

European and Japanese companies. Its annual sales of all displays is $1B. Sales of 3-D displays at present is only $12M annually, but is expected to grow to $300M in 3 years. Viewall spends $100M annually in R&D and is developing bio-interfaces and sensors that could revolutionize the industry. This new technology is 3-5 years away. Viewall displays are performance limited by the electro-optic laser arrays manufactured in a subsidiary plant. Viewall is interested in acquiring electro-optic array technology from a European company, but has no deal pending. Viewall is a member of the same major keiretsu organization that the Japanese bank belongs to.

Key challenges are:

1) Obtain financing for the development of the color displays
2) Decide how to proceed with development of color 3-D displays
3) Work to assure continuing leadership in displays

US Legislators (Senators and Representatives)

There is one Senator from California as well as one Member of Congress from New Mexico. Each promotes political, social, military and economic agendas in the interests of the US citizenry, as well as protecting certain interests in their home states.

Key challenges for all legislators are:

1) Develop and promote position on specific issues and policy options (in Appendix B)

The California Senator is a veteran of three terms who has influence on vital issues in the Senate. However, his or her approval ratings back home have dipped due to the perception that he has not done enough to stem the rising rate of unemployment in the State. The Senator is up for reelection in one year, and feels he can win if he can bring more jobs to the State. His best opportunity of doing this is to persuade Infomatics to expand their California facility rather than locating elsewhere. This would also augment the local transportation industry, which is very important to the State. Among the most vocal opponents of the Senator is an activist group that has rallied some of the citizenry to push for zero emissions at the Infomatics plant. The Senator has been a practical supporter of environmental issues in the past but has aroused the ire of the activist group due to his non-support of zero emissions.

The Senator has a brother working for Mechatronics who has been pressing him to use his influence with powerful financiers to help obtain new capital for Mechatronics. He has some feelings against repealing the Glass-Steagall Act (a repeal would allow banks to hold equity in corporations), but might be able to help Mechatronics in return for his support in repealing Glass-Steagall.

Key challenges for the California Senator are:

1) Persuade Infomatics to expand production in California
2) Do I run again?
3) Trade vote/influence on repeal of the Glass-Steagall Act for help for Mechatronics from financial friends?

The New Mexico Representative is a former business owner who was elected to his first term by a very large margin. He was the heir apparent to the former Representative who just retired. However, his political experience is very limited; he is very frustrated with the legislative process and is trying to push his ideas in the bullying fashion. The Representative was recently the subject of a scathing editorial in which accusations were made about environmental improprieties of his former business. Local environmentalists have called for a full investigation and are already mobilizing forces to assure that the Representative is not reelected. In addition, the Representative has actively sought the expansion of high-tech business in New Mexico, particularly from Horioka, a large Japanese OEM.

Key challenges for the New Mexico Representative are:

1) Deal with accusations and their effect on his political standing
2) Continue lobbying Horioka to locate in New Mexico or not

Department of Energy/Defense (ARPA) Official

The Departments of Energy and Defense have a primary mission of national security through both research and military means, and are interested in the SAMSON device for field use. This official was hired into the Department three years ago, before which he was employed as an executive in the aerospace industry. Because of his prior experience, he admittedly has a bias toward the aerospace industry yet realizes that electronics are critical to nearly all sophisticated mechanical processes. He has oversight for various research areas including electronics manufacturing and presently has uncommitted funding of about $50M per year for four years. However, with the budget cuts expected in the future, much or all of this could vanish.

Key challenges are:

1) How to best use uncommitted $50M/year
2) Bias toward aerospace industry, former employer
3) Maintain funding level despite overall government cuts

Department of Commerce Official

The Department of Commerce promotes economic agendas in the interests of the US citizenry, with respect to both national and international markets and issues. The US is in the midst of trade negotiations with Japan. Many in Congress feel strongly that import quotas should not be used. However, this official feels that Japanese officials are manipulative and dishonest and is considering the recommendation of certain quotas and restrictions. The Administration and Congress are under pressure to reduce the size of government, and there is speculation that DOC officials may be first on the block if their attitudes do not change. One specific event that has contributed to this officials' opinion is the supposed acquisition of strategic software from the US by Horioka. The accusations have been denied by top management at Horioka.

Key challenges are:

1) Deal with Horioka on robotics software issue
2) Develop position on import quotas

Japanese Officials (MITI and other Ministries)

There are three MITI officials and three Ministers of other organizations that interface with MITI whose objectives, parallel to those of the Japanese Government, are to promote Japanese political, social, military and economic agendas.

Key challenges for all government officials are:

1) Develop positions on specific issues and policy options (in Appendix B)

MITI Official The *Industrial Policy Bureau (IPB)* has responsibility for national industrial policy as well as taxation and financial issues. IPB exerts great control over the service sector of the Japanese economy. One current issue with regard to the SAMSON technology is its proposed dual use (military and commercial) in the US. Since Japan is prohibited by its constitution from supplying anything to another country that might be used for war, the sale of 3-D displays by Viewall to Infomatics has created a potential crisis. Traditionally, MITI has had more influence than the other ministries over large corporations such as Horioka, but that is changing as the corporations grow and the different ministries exert more autonomy.

Key challenges are:

1) Develop position on 3-D display dual-use issue
2) Handle issues by influence or regulation

MITI Official The *International Trade Policy Bureau (ITPB)* has responsibility for trade policy and country policy with respect to nearly all industries, including the service sector. ITPB has been dealing with IPB on the SAMSON dual-use issue. It has also been involved in trade talks with representatives of the US on the electronics, computer, and robotics industries. This is done jointly with the MFA, with whom the ITPB is not in total agreement with respect to the interaction of foreign and trade policies.

Key challenges are:

1) Develop position on 3-D display dual-use issue
2) Define or negotiate sole and common responsibilities with MFA
3) Negotiate favorable trade conditions with the US

MITI Official The *Machinery and Information Industries Bureau (MIIB)* interfaces with many of the other agencies and bureaus within MITI, and has specific responsibility for the automobile, airplane, computer, and electric appliance industries. With the imminent expansion of the information infrastructure and associated industries in Japan, the tension between MIIB and MPT has increased, since each feels it is responsible for control of the development of national telecommunications. Traditionally, MITI has had more influence than the other ministries over large corporations such as Horioka, but that is changing as the corporations grow and the ministries exert more autonomy.

Key challenges are:

1) Define or negotiate sole and common responsibilities with MPT, MFA
2) Separately or jointly fund expansion of national network infrastructure
3) Fight to retain (or graciously relinquish) influence with large corporations

The *Ministry of Finance (MF)* deals with financial policy and specifically the banking and investment arenas. In addition, they interface with MITI on both economic policy and the credit card industry. MITI and MF have some concern over the recent and sustained appreciation of the yen, and wonder if Japanese industry and employment will suffer some severe consequences resulting from overvaluation accompanying this appreciation. With the imminent expansion of the information infrastructure in Japan there is debate over whether funding for this expansion should come from private or public funds.

Key challenges are:

1) Assuring monetary stability in the face of appreciation of the yen
2) Promote private or public funding for expansion of infrastructure

The *Ministry of Posts and Telecommunications (MPT)* has responsibility for both public and private networks (both computer and phone). They also deal with communications hardware. MPT is currently battling with MITI (MIIB and IPB) over who will control development of the telecommunications industry and policy. The Internet is available in Japan, but has only minimal penetration. It is expected that this will grow rapidly, and oversight is needed. MFA is also involved since the links are international.

Key challenges are:

1) Define or negotiate sole and common responsibilities with MITI, MFA
2) Determine direction and link companies with funding sources

The *Ministry of Foreign Affairs (MFA)* has responsibility for foreign policy and interfaces with MITI when foreign and trade policies collide. Recently MFA has wanted to exert more influence over trade policy but has been rebuffed by MITI. They have also been in discussion with MPT over the increasing international links to a worldwide information infrastructure. In a related issue, MFA has been a point of contact for the US Department of Commerce over the alleged illegal acquisition of US software by Horioka.

Key challenges are:

1) Define or negotiate sole and common responsibilities with MITI, MPT
2) Deal with the Horioka robotics software issue

US Finance

The primary objectives of the US banker/venture capitalist/Wall Street interests are to maximize his yield at a minimum or reasonable risk in a relatively short time (1-3 years) and to support public policies that help the US financial sector.

Key challenges are:

1) Determine best method to get Glass-Steagall Act repealed - get industry support or use PAC contributions to support key legislators (notably the California Senator)
2) Provide capital to Mechatronics?

Japanese Banker

The primary objectives of the Japanese banker are to enable keiretsu endeavors while maximizing yield at minimum risk and to expand the banks portfolio outside Japan. The Japanese bank is also concerned about the continued appreciation of the yen and the resulting potential for default on some existing projects.

Key challenges are:

1) Reduce financing of Japanese business because of yen?
2) Finance a US company such as Mechatronics?

US Laboratory/University

This role represents both a high laboratory official (or committee of high officials from several laboratories) and a university professor (or consortium of Universities with a common purpose). National laboratories have traditionally had national security-related activities as a primary role. However, there is increasing discussion that their role could include environmental and industrial components now that the Cold War is over. University professors are continually weighing the balance between education and research.

Key challenges are:

1) (Lab) Stick to traditional national security roles and/or pursue industrial ties
2) (Lab) As a taxpayer-funded organization, can you work with individual companies who seek to better their market position through application of your technology?
3) (Univ) Promote education for next generation and/or secure research funding
4) (Univ) Secure funding alliances with industry or government or both or others

US Activist

This person represents two groups whose objectives are to limit pollution in California and to keep jobs in the US. Previously, you have supported the efforts by the New Mexico Representative to lobby Horioka to locate a plant there. However, with the recent allegations about environmental problems with the Representative's former business, you have called for a full investigation and are considering withdrawing your support from Horioka.

Key challenges are:

1) Both Infomatics and the California Senator want you to reduce your pressure on Infomatics to make their California plant emissionless
2) Work to discredit the New Mexico Representative?
3) Support location of Horioka plant?

US Media

This Senior Investigative Reporter has great credibility throughout the industry and with readers throughout the country. You recently wrote an expose on the illegal (or at the least unethical) acquisition of strategic US robotics design software by Horioka. You have been under pressure by the Department of Commerce to reveal your source of information, as they want leverage for future trade negotiations. In addition, another of your columns made accusations against the company formerly owned by the New Mexico Representative, who is well-liked by his constituents. These allegations have been vigorously denied by the Representative and company officials, who have called for a retraction and have threatened a lawsuit against you.

Key challenges are:

1) Reveal your information source about Horioka?
2) Retract your allegations about environmental wrongdoings?
3) Report interesting and relevant news to the public.

Japanese Media

The Japanese media has traditionally acted almost as an arm of government and has presented information slanted entirely to the Japanese party-line point-of-view. Their style is emotional, inflammatory and can often promote misinformation. Your primary sources of financial and foreign policy information within the government will both retire in the coming weeks. As a result you must develop new information sources quickly or you may lose your status with your boss and within the media establishment. Additionally, your best friend, a fellow journalist, has written a draft exposé on the dangers of disloyalty among Japanese workers. He claims that too much technology and know-how have already fled to the US in search of affordable housing. You have concerns that if his piece is published it will simply serve to plant ideas in more young Japanese minds.

Key challenges are:

1) Develop new sources of information among MITI and other ministries
2) Do you prepare a harsh rebuttal to your friends' intended exposé?

US Distributor

TechWorld is a medium-sized distributor of computers and related products with nationwide clientele. Distribution is primarily through regional stores operating with high volume and low markup. You have traditionally carried and sold a large volume of Infomatics products. Recently, however, Horioka has informed you that they are willing to sell to you in bulk at below wholesale cost, especially in the new SAMSON market. You are skeptical that they will raise prices as soon as they feel they have sufficiently penetrated the market. Meanwhile, Infomatics is pressuring you to 'Sell American,' both in existing product lines and in the new SAMSON market. You perceive that the future market for SAMSON products will be enormous and are currently working to position yourself as the leading US distributor in that market.

Key challenges are:

1) Retain loyalty to US companies?
2) Reap short-term profits by dumping products for Horioka?
3) Forge alliances that will make you the primary US SAMSON distributor

Japanese Distributor

You are a small wholesaler of Horioka and other Japanese products and supply many shops in the Tokyo area with their products. However, an American, knowing that you have mounting personal debt, has approached you about buying Horioka products from him at below your cost. He would buy the products in the US and ship them back to Japan at a lower cost than you get from Horioka. In addition, a US company, Infomatics, has approached you to distribute a current entertainment product, *SameBoy*, and has indicated that they will allow you to carry their new SAMSON product if you sign up now. Meanwhile, you are receiving pressure from Japanese manufacturers to increase your mark-up on US goods so that you can decrease your mark-up on Japanese goods.

Key challenges are:

1) Maintain loyalty to Horioka or buy their products from the American
2) Increase mark-up on US goods?
3) The market for SAMSON will eventually be very large in Japan. You want to remain in favor with both Japanese and US manufacturers of SAMSON products since it is unclear which team will be first to the marketplace.

US Public (worker/consumer)

This role represents a cross-section of the American public that can choose between competing products, and suggest improvements that would increase demand. Additionally, this role can represent the worker(s) at any of the American companies. You have heard that the TechWorld distribution chain is considering dumping of Japanese products for profit, pricing them slightly lower than the competing US products.

Key challenges are:

1) Would you buy a SAMSON, either for business or personal use?
2) Respond to the rumor about TechWorld - Will you patronize them or not?
3) Are work practices at Infomatics and Mechatronics fair?

Control Team

The Control Team is the game control. They represent the rest of the world. This team provides any additional information, clarifications, and represents all conceivable roles outside those specifically defined. The Control Team will:

1) Participate in team negotiations as requested
2) Provide information and responses as needed
3) Determine probabilistic outcomes of investments and negotiations
4) Keep the game interesting and moving.

APPENDIX A: TECHNOLOGY AND POLICY TOOLKIT

Indicate the number of US dollars and and/or influence credits your role wants to spend for each option. The offer by all roles will be added for each option to get a total offering. The probability of an option being implemented increases with the total offering for that option so influencing other roles to add their offers to yours will pay. Please circle your role .

Note: A policy option must have at least one influence credit to be submitted. Additional influence credits over the initial one will increase probability of implementation by 10% each. Technology options do not require influence credits to be submitted.

Role	Influence Credits Money (M$)	Role	Influence Credits Money (M$)
Infomatics	$800	Horioka	$2000
Mechatronics	180	Viewall	320
US Senator	250	MITI: IPB	150
US Representative	250	MITI: ITPB	100 1
DOE/DOD/ARPA	150	MITI: MIIB	150
DOC	150	Min. of Finance	150
US Activist	2	Min. of Posts & Telecom	150
US Media	2	Min. of Foreign Affairs	100 1
US Finance	2	Japanese Banker	3
US Lab/Univ	2	Japanese Media	3
US Worker/Consumer	2	Japanese Distributor	3
US Distributor	2		

Technology Options	Cost (M$) for 50% chance	Your offer
Substrates, Board Assembly and Packaging		
Recently patented robotic controllers for electronics manufacturing enable precision alignment for high-density board assembly at 70% greater speed, 55% less cost per board, and 3% higher yields than currently implemented process can provide. *Expected outcome: lower costs and prices, increased demand*	150	_____
Board Assembly breakthrough lets electronics be packaged directly on the display for a 50% reduction in size and weight. *Expected outcome: lower display costs and prices, increased demand*	100	_____
Packaging breakthrough lets electronics be packaged cost effectively on diamond substrates to double the computing power with good thermal management. *Expected outcome: higher power/cost, increased demand and market share*	100	_____

Patented, automatically controllable, continuously variable transmission enables the feeding of thin laminate substrates through high-speed electronics manufacturing devices for a 30% improvement in yield for a 3% increase in the cost of the line. *Expected outcome: lower costs and prices, increased demand* 100 _____

Manufacturing Information and Management Systems

Intelligent-agent software demonstrated 30% more effective education and training throughout the factory, managers and employees, at 20% less cost per employee. Beta testing demonstrated a sustainable and affordable increase in worker productivity by 6% per year. *Expected outcome: lower prices, higher profits* 100 _____

ARPA program in manufacturing information systems provides validated computer models for accelerated engineering of electronic products without the need for extensive prototyping and testing. Design cycle time is reduced by 40%. *Expected outcome: faster to market, increased market share* 160 _____

Validated simulation and modeling tools for electronics design and development have been integrated into an intuitive synthetic environment system that reduces the design time for manufacturing cycle of complex electro-mechanical devices from 15 months to 4 months. *Expected outcome: lower overhead and costs, faster to market, increased market share* 140 _____

Photonics and Displays

New, 0.2 micron precision assembly technology for electro-optic devices demonstrated 30% improved yields (from 70% to 93%) and corresponding cost reductions in the manufacture of high-volume photonics components. *Expected outcome: lower costs and prices, increased demand* 180 _____

High resolution, 3-D, flat panel display (20 cm by 25 cm) becomes available for $150 each. 140 _____

High resolution, 3-D, direct retinal projection display becomes available at $500/unit . *Expected outcome: competitive advantage, new markets* 200 _____

Software

Inference engine for artificial intelligence software allows practical adaptive learning in computer driven devices. *Expected outcome: competitive advantage, licensing potential* 200 _____

Policy (Non- Technology) Options	Cost (M$) for 50% chance	Your offer
The implementation of the National Electronics Manufacturing Initiative (NEMI) Roadmap is institutionalized by an industry-led and government-partnered entity, co-funded at the rate of $300M per year (through ARPA's special procurement authority) in the form of a virtual entity with an accountable program management leadership and staff managing pre-competitive research and development performed in industry labs, national labs, and universities as the NEMI managers deem appropriate. The goal is to make the US the location of choice for electronics manufacturing.	200	_____
Formal keiretsu initiative in Japan with the goal of making Japanese companies the companies of choice for global business and consumer electronics.	200	_____
Government establishes a comprehensive and flexible policy on intellectual property rights for all government agencies (ministries).	120	_____
Industry associations and government environmental agencies form partnership and improve effectiveness (performance and cost) of environmental regulation and implementation in electronics manufacturing industry, reducing the environmental compliance cost by 50%.	160	_____
Abusive shareholder suits over stock fluctuations are curbed by government action. They have been inhibiting companies' going public; high-tech companies were especially vulnerable.	80	_____
Government establishes a focal point for foreign technology monitoring and assessment.	80	_____
Government establishes lifelong training policy and practice.	160	_____
Regional agency establishes workforce training programs; assures focus on high skill requirements needed for domestic electronics manufacturing.	120	_____
Regional alliances, industry associations and consortia work with state and federal agencies to share information vital for increasing economic prosperity.	40	_____
Government decides foreign participation in government-industry co-funded projects is allowed if domestic economic activity is enhanced sufficiently to justify government investment.	160	_____

Industry-government partnership creates infrastructure for virtual enterprises to facilitate product realization.	200	_____
Glass Act is repealed to enable banks to hold equity in corporations and increase availability of low cost capital (US only).	200	_____
Companies do not have to give government intellectual property rights for commercial applications of innovations developed with in-house funds when used on government contracts.	140	_____
Industries that are critical to defense, energy, health care, agriculture, the transportation and communication infrastructures, or the environment, are encouraged to pursue industry-led and government-partnered and co-funded (through ARPA's special procurement authority) consortia with national laboratories whose core competencies are enabling to the industry. In this manner, industry gains precompetitive technology under industry program management, the government gains closer ties with critical commercial technology for spin-on application to its public missions, and the national labs are de facto re-engineered by the industry influence without forfeiting their responsibilities to the public missions.	200	_____
Government subsidizes school boards to provide every child (10 to 18) a personal data assistant and free access to the Internet.	240	_____

APPENDIX B: DETAILED INFORMATION

Infomatics, Inc.: US Computer Manufacturer

Company structure, assets, and context for decisions

You are a leader in sales of high-tech personal computers, entertainment and communication devices. You are pioneering, in the US, a new class of device utilizing virtual reality concepts, global positioning and world connectivity (generically called SAMSON). Your company had $3B in sales last year with a net income of $200M. You invest $300M annually in R&D. You have a US Government contract totaling $3M, annually, to develop advanced displays and other bio-interfaces.

You assemble 30% of your products on shore. Four years ago you were forced to heavily automate assembly and have invested $75M in robotics. This equipment is now in need of up-grade. Some of the best automation equipment for your assembly is manufactured by your direct competitor, (Horioka, a Japanese company with 40% market share of early SAMSON devices, in comparison to your 45% market share). A key component, namely 3-D displays, are manufactured exclusively by Viewall, another Japanese Company. You own key patents and intellectual property in software and architecture. These key patents you have licensed to Horioka to obtain these high-tech robotics. Your license agreements with Horioka are due to expire in 18 months.

Your research department has been working on advanced 3-D displays with an annual budget of $15M. You have some good technology, but cannot keep up with the $100M+ R&D in displays being spent by your competitors. You have submitted several white papers for funding your display technology and may shut down the operation if no federal funding is obtained.

You have 5 major manufacturing/R&D centers:

1) Texas - Automated PC assembly plant, featuring advanced automation purchased from Horioka and Mechatronics. This plant generates $590M of sales per year, borrows money at 12% annual interest, uses 116 robots initially costing $300K each, and employs 806 people at labor costs of $15 per hour for a “labor” (people plus debt retirement on automation) annual cost of $72M. The plant produces $8.20 of sales per dollar “labor” cost.

2) Singapore - Automated PC assembly. Produces about 70% of all your PC products. Has low labor costs and a highly skilled work force. Plant features advanced automation purchased from Horioka. This plant generates $1.4B of sales per year, borrows money at 4% annual interest, uses 198 robots initially costing $300K each, and employs 2886 people at labor costs of $8 per hour for a “labor” (people plus debt retirement on automation) annual cost of $133. The plant produces $10.40 of sales per dollar “labor” cost.

3) Mexico - Produces video, entertainment and telecommunications equipment. This is a brand new plant that consolidates several small production centers around the world. You have invested $160M in the plant, but revenues have been insufficient to cover the investment. Assembly is somewhat automated, utilizing assembly equipment from Mechatronics and Horioka. (You are beta testing the Mechatronics Robo-APS tool in this plant and are very satisfied with its performance). This plant has your lowest labor costs, but the work force is undertrained. This plant generates $860M of sales per year, borrows money at 10% annual interest, uses 149 robots initially costing $300K each, and employs 1486 people at labor costs of $7.90 per hour for a "labor" (people plus debt retirement on automation) annual cost of $72M. The plant produces $12 of sales per dollar "labor" cost. You have a 3-year tax incentive from the Mexican government which will expire in 18 months. You are working to extend the tax break and if possible sweeten the deal. The Mexican government wants you to bring the SAMSON production to this plant in return for continuing favorable tax credits.

4) California - Military products & pilot line assembly. This plant is charged with the production of the military SAMSON devices. The plant has limited automation equipment, and the highest labor costs. The labor is highly skilled. This plant has your highest cost structure. This plant generates $350M of sales per year, borrows money at 12% annual interest, uses 30 robots initially costing $300K each, and employs 1009 people at labor costs of $20 per hour for a "labor" (people plus debt retirement on automation) annual cost of $107M. The plant produces $3.30 of sales per dollar "labor" cost. All robots in this plant are supplied by Mechatronics.

5) California - R&D center.
Houses 4 R&D activities, Advanced concepts, Software, Displays & Peripherals, and Manufacturing Sciences. The SAMSON concept was developed by your R&D center on a cost-shared DOD contract. The annual budget of the center is $200M.

Specific Issues to be resolved for SAMSON

You have developed SAMSON as a military battlefield communications device on a DOD contract. The DOD program calls for 5000 SAMSON devices to be delivered within 18 months at a price of $17K each. You produce these devices at your California Assembly plant, with extensive manual assembly. This military device is heavy, lacks a fast color display, has limited battery life and has slow performance. Your commercialization goal is within 5 years to produce a full color device for a selling price of $3K and a weight of 3 lbs. with an 8-hour battery life.

Key challenges are:

1) Advanced automated assembly and packaging
2) Better display technology
3) Better software
4) Location of Production
5) Activists demanding zero emissions in California plant

Challenge I: Automated Assembly and Packaging

To reduce weight and cost of the device, stacked circuits on advanced diamond substrates will be required along with sophisticated assembly and testing. No one can currently produce the automated packaging, assembly and test equipment needed for the commercial version of SAMSON. Horioka has a major effort in CAD/CAM assembly/testing and plans to have the necessary equipment available in 4 years. Since Horioka is one of your direct competitors, you have had to offer technology in return for receiving advanced robotics. Mechatronics has also been developing the necessary automation/test equipment under their own funds and with SEMATECH and ARPA contracts. However their long-term viability is in question. New Mechatronics tools (Robo-APS) have been evaluated by SEMATECH as best in the field, but Mechatronics has had great difficulty in getting many sales due to their unstable financial situation.

You will require this advanced automation within 4 years. You have 5 (or more) choices.

Option I-A: Plan on purchasing the automation equipment from Horioka.

> They are your direct competitors. Horioka has traditionally sold their automation equipment openly, but you have fears about depending on key tooling from your competitors.
>
> Horioka has expressed interest in jointly funding the development of automation equipment with you, and is suggesting a $30M (each) per year development program.

Option I-B: Purchase from Mechatronics.

> Mechatronics was once a world leader in robotics equipment, but has been losing market share steadily for the past 10 years. Presently they have about 7% of the semiconductor market share and are in a shaky financial situation. They will require a minimum of $200M of investment capital to remain viable, and an additional $50M per year for the next 3 years to develop the necessary equipment for SAMSON. Recent tools for advanced diamond packaging, developed with help from SEMATECH, have been determined as best in the field by SEMATECH, but as yet Mechatronics has received few orders.
>
> Risks are very high that Mechatronics will go out of business, jeopardizing your ability to produce SAMSON, should you decide to go with Mechatronics. For Mechatronics to be viable, they need financial assistance.

Option I-C: Develop the full automation system in-house.

Option I-D: You may wish to buy Mechatronics or capitalize them.

Option I-E: Advocate a US Government pre-competitive sponsorship of an Intelligent Machine Initiative.

Challenge II: Displays

In the military version of SAMSON, the B&W 3-D display is the single largest power consuming device, and adds about 5 lbs. to the device weight. Your display R&D center, as well as Viewall, has been working on a color 3-D display that would cut the power consumption in half, and the display weight to 2 lbs. The display you use in the military product is purchased from Viewall. You have an important patent on a non-linear optical element needed for color 3-D technology, but Viewall has an important patent on quantum-coupled laser diodes, used in the B&W displays and directly applicable to the color displays. Eurolaser has been developing 3-D laser array technology which, if feasible, could substantially improve performance without the need for the expensive non-linear optical elements or quantum-coupled laser technology.

You have been spending $15M a year in R&D on color 3-D displays. Though you have some good technology, a $200M investment will be required to commercialize. Additionally you will have to get a license from Viewall for their quantum-coupled technology, or produce a hybrid utilizing your non-linear optical crystals and Viewall's lasers.

Viewall has been interested in obtaining a license for your non-linear optical technology. Since this is vital to the success of 3-D displays, this patent is a key bargaining chip.

There is much political sensitivity about not having a domestic 3-D display technology.

You have been very satisfied in your association with Viewall in the past. In fact 90% of all of your laptop displays for your traditional PC's are produced by Viewall. You do not want to jeopardize your favorable sales position with Viewall.

Your technical people are very interested in the technology being developed by a small European company. Though this technology is in its early stages, it could revolutionize the 3-D display technology and make your and Viewall's patents worthless. The European company is looking for a financial partner and has had many discussions with Viewall.

Option II-A: Negotiate favored treatment with Viewall for displays.

Option II-B: Negotiate with the US Government on a display production initiative to have a US source.

Option II-C: Produce displays in-house. Negotiate a license with Viewall for their quantum-coupled laser diode technology, or negotiate a license for the European technology.

Option II-D: Negotiate with the European company on a joint venture.

Challenge III: Software

The present operating system software for the military version of SAMSON is based on your priority PC operating system called OSPC. This operating system is the world's standard for laptop and portable PC personal communicators. You license this operating system to Horioka and others for their PC products, and in return get preferred customer

status on automation equipment as well as substantial royalties. Unfortunately, the OSPC is 10 years old and limits performance of SAMSON. Your software group has produced many OSPC patches to stretch the performance of SAMSON while still maintaining software compatibility with OSPC. Horioka has tried unsuccessfully in the past to introduce a new operating system, but the large base of OSPC users has limited the interest in any new operating system. However since SAMSON is a dramatically different technology, compatibility with OSPC is less important.

Your software group has been working on a new AI-based operating system called Mastermind, which has only limited OSPC compatibility. This new software can boost performance of SAMSON by 30%.

A Ukrainian software company has claimed to be developing a full OSPC-compatible software package which gets around the OSPC limitations for SAMSON while achieving up to a 180% performance improvement with substantially increased capability. However claims from this company in the past have proven to be exaggerated.

Option III-A: Renegotiate license agreements on OSPC with Horioka and/or Schmidt.

Option III-B: Abandon OSPC and use Mastermind as the OS for SAMSON.

Option III-C: Pursue ties with the Ukranian company to obtain their expertise or validate their claims.

Challenge I V: Location of Production

Option IV-A: Since Horioka can manufacture at lower cost, you may want to consider buying/importing SAMSON from Horioka with the stipulation of early access to new designs and upgrades. If so, you may also work to streamline the import process since the US Government is very concerned about the trade deficit.

Option IV-B: Enter into a joint development/production effort with Horioka.

Option IV-C: Add automation equipment to the Texas plant. This would be the least costly, but your labor costs are higher. This is your preferred option. However since SAMSON production would be a fully automated assembly, your labor unions have concerns about displacing hundreds of low-skilled assembly technicians with a much smaller number of highly skilled technicians and engineers.

Option IV-D: Assign SAMSON production to your Mexico plant, which is looking to get the production, since they can get concessions from the Mexican government. However, installation and plant upgrade costs for production would be higher here than at any other plant. Wage rates here are your lowest, but SAMSON assembly will be highly automated, and require more highly skilled technicians and engineers. Also the Mexico plant has excess capacity, and adding SAMSON to Mexico would make the substantial Mexican investment profitable.

Option IV-E: Singapore is another option. However, you have concerns over disrupting your PC production line.

Option IV-F: The California Senator has been lobbying you to expand production in your California plant. This is your most costly option.

Option IV-G: Another option is to build a new plant.

Challenge V: Activism at your California Plant

In addition to being your most costly plant to operate, your operations in California are under increasing scrutiny and pressure with regard to effluents and other waste streams. Activists are calling for the plant to have zero emissions within two years. Your Senator is supportive of your efforts and does not support zero emissions, although he has supported environmental causes in the past.

Option V-A: Ignore the issue.

Option V-B: You realize that the activist group supports high paying jobs in the region in addition to zero emissions. Threaten to close the plant and expand production elsewhere if the activist group continues its pressure.

Option V-C: Invest in R&D to develop cleaner technologies with the objective of applying the new technologies in all facilities, and licensing them to other vendors.

Option V-D: Any other option you may think of.

Other Opportunities

Examine the Technology and Policy Toolkit for initiatives for your team to push.

RESOURCES AVAILABLE:

Your team initially has $800M to spend on making deals and investing in Toolkit Options. Additional funds, if needed, must be raised through borrowing from the US Financier or Japanese Banker or receiving funds from other teams. The current price of your stock is $7.50 per share, with 422,416,498 shares outstanding.

Horioka, Ltd.: JapaneseComputerManufacturer

Company structure, assets, and context for decision s

You are a major supplier of these high tech, computer and entertainment/communication devices (SAMSON) with 40% market share. Your factories are highly automated, utilizing equipment developed internally. You are a large, diversified company with annual consumer electronics and computer sales of $10B. Last year sales of SAMSON predecessor type products totaled $40M and you expect SAMSON sales to exceed $500M within 3 years of their introduction. You invest $400M annually in electronics R&D. You have license agreements to use and distribute OSPC from Infomatics and the use of other Infomatics patents for your PC line, but it does not cover SAMSON. You are developing new technologies to circumvent the patent issues; however the priority operating system leaves you with little choice but to negotiate a new license agreement or try to introduce a new operating system which may not have wide acceptance.

You have obtained the patent rights, in the past, due to your strong position in automated assembly. Your high levels of automation allow you to manufacture products at a lower cost/higher margin than Infomatics. This automated assembly equipment is manufactured and sold worldwide by your advanced automation division. This division supplies automation equipment for the semiconductor and electronics industry with annual sales of about $700M.

You are also a manufacturer of CPU's and DRAM. You also purchase your 3-D displays from Viewall.

You have 6 major manufacturing and R&D centers associated with the SAMSON effort.

1) Yokohama - PC assembly
   The world's most advanced & automated PC assembly line. All of your high- end computers and portable computers are manufactured and assembled here. The sophisticated automation allows you to produce PC's at a substantially lower cost with better quality control than your competitors. This plant generates $2.1B of sales per year, borrows money at 4% annual interest, uses 470 robots initially costing $300K each, and employs 2347 people at labor costs of $16 per hour for a "labor" (people plus debt retirement on automation) annual cost of $226M. The plant produces $9.50 of sales per dollar "labor" cost.

2) Osaka - Telecommunications Assembly
   Manufactures pagers, cellular telephones, portable telephones, etc. This plant generates $2.2B of sales per year, borrows money at 4% annual interest, uses 328 robots initially costing $300K each, and employs 4646 people at labor costs of $16 per hour for a "labor" annual cost of $408M. The plant produces $5.50 of sales per dollar "labor" cost.

3) Indonesia - Entertainment Electronics and Computers
   Manufactures video games, TVs, VCRs, calculators, printers, and low end PCs. A highly automated plant. This plant has low labor costs. This plant generates $3.6B

of sales per year, borrows money at 4% annual interest, uses 669 robots initially costing $300K each, and employs 5592 people at labor costs of $4 per hour for a "labor" annual cost of $160M. The plant produces $22.50 of sales per dollar "labor" cost.

4) Toyonaka - Peripheral Technologies Assembly and Robotics
   Here you manufacture and assemble displays and drives for your PC's as well as your advanced robotics. About 30% of all your active matrix displays are supplied by this plant. The remainder are purchased from Viewall. This plant generates $1B of sales per year, borrows money at 4% annual interest, uses 173 robots initially costing $300K each, and employs 1936 people at labor costs of $16 per hour for a "labor" annual cost of $172M. The plant produces $6 of sales per dollar "labor" cost.

5) Oregon - PC R&D center
   Developer of your low-power technology. Runs on an annual budget of $106M.

6) Kyoto - Communication and Computer Technology R&D center
   Operates on an annual budget of $210M.

You are a direct competitor to Infomatics in PC's and telecommunication equipment. Your PC's are based on OSPC which you license from Infomatics. You have tried unsuccessfully in the past to introduce your own operating system, but the user base in OSPC is too large. You have obtained the software license agreements by cooperating with Infomatics on robotics, assembly and testing. You have sold advanced robotics as part of this agreement to Infomatics.

You also have a plant that manufactures electronic components for automobiles including chips for fuel injector systems, digital gauges and displays, and audio devices. This plant generates $1.6B of sales per year, borrows money at 4% annual interest, uses 285 robots initially costing $300K each, and employs 1816 people at labor costs of $16 per hour for a "labor" annual cost of $170M. The plant produces $9.40 of sales per dollar "labor" cost.

Specific Issues to be resolved for SAMSON

Your Oregon and Kyoto research centers are developing a SAMSON type product. The Oregon center is developing one with OSPC as the backbone, while Kyoto is developing an ultra-high performance unit based on a new operating system. Like Infomatics, your commercialization goal is within 5 years to produce a full color, 3-D SAMSON device for a selling price of $3K and a weight of 3 lbs. with an 8-hour battery life.

Since SAMSON is radically different from standard PCs, a new operating system might be acceptable if you beat Infomatics to market.

Key challenges are:

1) Advanced automated assembly and packaging
2) Better display technology
3) Better software
4) Location of Production

5) Accused of illegally obtaining state-of-the-art robotics design software from a small US firm

Challenge I: Automated Assembly and Packaging

To reduce weight and cost of the device, stacked circuits on advanced diamond substrates will be required along with sophisticated assembly and testing. Though you cannot currently produce the automated packaging, assembly and test equipment needed for the commercial version of SAMSON, you have a major effort in CAD/CAM assembly/testing and plan to have the necessary equipment available in 4 years. However, the development of these new tools will cost $250M over 4 years. You and Infomatics have talked about a joint development program on CAD/CAM for SAMSON as well as joint software and operating system development.

Option I-A: Buy Mechatronics or capitalize them.

> Mechatronics was once a world leader in robotics equipment, but has been losing market share steadily for the past 10 years. Presently they have about 7% of the semiconductor market share and are in a shaky financial situation. They will require a minimum of $200M of investment capital to remain viable, and an additional $50M per year for the next 3 years to develop the necessary equipment for SAMSON. Recent tools for advanced diamond packaging, developed with help from SEMATECH, have been determined as best in the field by SEMATECH, but as yet Mechatronics has received few orders.
>
> Risks are very high that Mechatronics will go out of business, jeopardizing your ability to produce SAMSON should you decide to go with Mechatronics. For Mechatronics to be viable, they need financial assistance.

Option I-B: Approach the Japanese government to advocate interdependency policy with the US Government and refrain from the US Intelligent Machine Initiative.

Option I-C: Initiate a joint development program with Mechatronics and/or Infomatics.

Option I-D: Agree to purchase robotics from Mechatronics.

Option I-E: Continue to develop robotics independently.

Challenge II: Displays

In the military version of SAMSON, developed by Infomatics, the B&W 3-D display is the single largest power consuming device, and adds about 5 lbs. to the device weight. Infomatics, as well as Viewall, have been working on a color 3-D display that would cut the power consumption in half, and the display weight to 2 lbs. The display used by Infomatics in the military product is purchased from Viewall. Infomatics has an important patent on a non-linear optical element needed for color 3-D technology, but Viewall has an important patent on quantum-coupled laser diodes, used in the B&W displays and directly applicable to the color displays. A small European company has been developing 3-D laser array

technology which, if feasible, could substantially improve performance without the need for the expensive non-linear optical elements or quantum-coupled laser technology.

You have been assisting Viewall in the development of these 3-D color displays and are spending $20M annually in 3-D display R&D in your Kyoto and Toyonaka facilities.

Option II-A: Develop a 3-D display in-house.

Although you have some good technology, a $200M investment will be required to commercialize your 3-D displays. Additionally you will have to get a license from Viewall for their quantum-coupled technology and a license from Infomatics for their non-linear optical crystals.

Option II-B: Establish a joint venture with the European company.

Your technical people are very interested in the technology being developed by the European company. Though this technology in its early stages it could revolutionize the 3-D display technology and make your and Viewall patents worthless. The European company is looking for a financial partner and has had many discussions with Viewall.

Option II-C: Negotiate with Viewall to obtain preferential treatment in return for your support of their establishing a joint venture with the European company.

You have been very satisfied in your association with Viewall in the past. In fact 60% of all of your laptop displays for your traditional PC's are produced by Viewall. You do not want to jeopardize your favorable sales position with Viewall.

Challenge III: Software

You must decide on the operating system for SAMSON. The present operating system for your PC's is OSPC, a proprietary OS licensed from Infomatics. This operating system is the world's standard for laptop and portable PC personal communicators. Unfortunately, the OSPC is 10 years old and limits performance of SAMSON. You have tried unsuccessfully in the past to introduce a new operating system, but the large base of OSPC users has limited the interest in the new operating system. Kyoto has been working on a new operating system which has no OSPC compatibility but would provide the best performance for SAMSON products.

A Ukrainian software company has claimed to be developing a full OSPC-compatible software package which gets around the OSPC limitations for SAMSON while achieving up to a 180% performance improvement with substantially increased capability. However claims from this company in the past have proven to be exaggerated.

Option III-A: Renegotiate license agreements on OSPC with Infomatics.

Option III-B: Develop your own operating system.

Option III-C: Pursue ties with the Ukranian company to obtain their expertise or validate their claims.

Challenge IV: Location of Production

Option IV-A: You can upgrade one of your existing plants, or build a new plant.

> Both Yokohama and Osaka are interested in manufacturing SAMSON, since both plants have excess capacity. However, your Indonesia plant would be the lowest cost alternative.

Option IV-B: Build a new plant.

Option IV-C: Negotiate a joint development/production effort with Infomatics.

Challenge V: Accusation of illegally obtaining state-of-the-art robotics design software from a small US firm

Option V-A: Ignore the issue.

Option V-B: Admit that you obtained the software, but promise that you won't use it.

Option V-C: Return the software to the US Department of Commerce, and issue an official apology for your actions. Make remuneration in a mutually acceptable fashion.

Option V-D: Any other option you may think of.

Other Issues and Possible Business Decisions

Since you can manufacture at lower cost, you may want to negotiate the manufacture and export of SAMSON machines for Infomatics. You may want to pressure the Japanese Government on having a tough stand on the trade surplus with the US or about establishing a free-trade agreement with the US.

Examine the Technology and Policy Toolkit for initiatives for your team to push.

RESOURCES AVAILABLE:

Your team initially has $2.0B to spend on making deals and investing in Toolkit Options. Additional funds, if needed, must be raised through borrowing from the Japanese Banker or US Financier or receiving funds from other teams. The current price of your stock is $13.50 per share, with 720,000,000 shares outstanding.

Mechatronics Inc. US Robotics Manufacturer

Company structure, assets, and context for decisions

Your main business is automated assembly of printed circuit boards, and automated wafer handling. You also supply some robotics to the automotive industry. Additionally, you have developed some automated advanced packaging equipment, but have seen few sales. You have total annual sales of $75M, but your sales position has been slipping dramatically. You hope these new advanced packaging and MCM assembly tools will help you regain some lost business. Even though SEMATECH has declared your advanced packaging tools as the best in the field, the word has not gotten out, so they are still viewed as inferior to those available off-shore. You have a $1M R&D program with SEMATECH to develop advanced robotics, and a $400K ARPA contract on CAD/CAM simulation & software development. You also have a $400K jointly funded program with Jefferson National Laboratory (JNL) to develop advanced robotics concepts. You have several R&D efforts which could have significant impact on your business, but you lack the capital needed to implement them.

You have proposed the establishment of a manufacturing/user consortium for the development and manufacture of advanced robotics. Additionally, you have approached Infomatics about a joint development program.

Eighty-five percent of your sales are in the automotive and heavy industry market. Your Flint plant has been seeing annual profits of $16M, but much of this profit is supporting your losses in Lexington. The semiconductor operations was purchased by your company 4 years ago. You invested heavily in trying to make the semiconductor operations profitable. You have been working with ARPA and SEMATECH to develop advanced tools, and recently your most advanced packaging and assembly tool (Robo-APS) has been awarded best of the breed by SEMATECH. You have had Robo-APS tool evaluation sales to SEMATECH, AMD, Infomatics, and AT&T, but have seen no production level sales. Infomatics has been beta testing Robo-APS in their Mexico plant and are very satisfied in its performance.

You have 2 plants:

1) Semiconductor Equipment Operations - Lexington, Massachusetts
   This plant has accumulated a large debt. Estimated development costs for SAMSON automation are $50M per year over 3 years. This plant generates $25M of sales per year, borrows money at 12% annual interest, and employs 74 people at labor costs of $14 per hour for a “labor” (people plus debt retirement on automation) annual cost of $5.6M. The plant produces $4.50 of sales per dollar “labor” cost.

2) Automotive Products - Flint, Michigan
   This is also your headquarters. This plant generates $50M of sales per year, borrows money at 12% annual interest, and employs 86 people at labor costs of $13 per hour for a “labor” (people plus debt retirement on automation) annual cost of $6.4M. The plant produces $7.80 sales per dollar “labor” cost.

Issues and Possible Business Decisions

Option I: Lexington financial troubles.

You need to decide what to do with your semiconductor operations. Your investors are becoming increasingly dissatisfied with the poor performance of the Lexington operations. Possible options are:

1) Look for a buyer of the Lexington Operations.

2) Work to establish a market for the Lexington Machines. This will require substantial capital since a major fear is the long-term survivability of the Lexington operations. Possible avenues for financing are:
   - 2a) Borrow capital from a venture capital company in return for equity position.
   - 2b) Obtain financing from Infomatics in return for equity and advanced exclusive access to new designs.
   - 2c) Obtain Infomatics or Schmidt commitment to buy products under agreed upon conditions to encourage investors.

3) License the Robo-APS tool to Horioka for production.

Option II: Technology development.

1) Expand joint development efforts with a national lab.

2) Obtain Infomatics commitment in consortium for TRP to develop US source of intelligent machines for manufacturing.

3) Obtain US Government assistance in creating US source of intelligent machines for manufacturing through SBIR grant.

Other Opportunities

Examine the Technology and Policy Toolkit for initiatives for your team to push.

RESOURCES AVAILABLE:

Your team initially has $18M to spend on making deals and investing in Toolkit options. If funds are spent on toolkit options, a multiplier of 10 is used (a $10M investment in a Toolkit option is worth $100M to you). Additional funds, if needed, must be raised through borrowing from the US Financier or Japanese Banker or receiving funds from other teams. The current price of your stock is $1.00 per share, with 8,050,000 shares outstanding.

Viewall, Inc.: Japanese Display Manufacturer

Company structure, assets, and context for decisions

You manufacture 95% of the world's 3-D displays for which you and MITI have invested $250M in their R&D. You are currently selling without prejudice to all US, European and Japanese companies. Your annual sales of all displays is $1B. Sales of 3-D displays at present is only $12M annually, but you expect this to grow to $300M in 3 years. You spend $100M annually in R&D and are developing bio-interfaces and sensors that could revolutionize the industry. This new technology is 3-5 years away. Your displays are performance limited by the electro-optic laser arrays manufactured in a subsidiary plant. You have interest in acquiring electro-optic array technology from a small European company, but have no deal pending.

Your Nagoya R&D center is developing low-power color 3-D displays needed for SAMSON. A critical component for these displays is a quantum-coupled laser diode modulator which you have developed and patented. However, additional technology is needed.

There are 3 options:

1) Use of a non- linear electro-optic element patented by Infomatics;
2) Use of the European developed laser arrays; and
3) Dichroic phase modulation to simulate color. You have already shown the applicability of dichroic modulation. However, this approach results in muted colors, but otherwise would meet all other performance objectives. You have been able to show superior color rendition when the non-linear optical elements are used, but production would require an Infomatics license. The European arrays could potentially make the best performance displays without the need for non-linear elements or quantum-coupled laser modulators. However, this technology is unproven and has only a 60% chance of success if fully funded.

Horioka has been assisting you in the 3-D display R&D and has been spending $20M annually in 3-D display technology.

You have 2 major facilities:

1) Nagoya R&D center
   Annual operating budget of $80M.

2) Tokyo Manufacturing center
   This plant generates $1000M of sales per year, borrows money at 10% annual interest, and employs 1817 people at labor costs of $15 per hour for a "labor" (people plus debt retirement on automation) annual cost of $153M. The plant produces $7.00 of sales per dollar "labor" cost.

Issues and Possible Business Decisions

1) Obtain financing for the development of the color displays.

a) Encourage MITI to finance the development.
b) Obtain investment capital.
c) Obtain financing from Horioka.

2) You must decide how to proceed with the development of the color 3-D displays.
a) Obtain a license to manufacture and use non-linear elements from Infomatics.
b) Negotiate a purchase and use agreement with Infomatics for these elements.
c) Obtain financing to purchase Infomatics.
d) Obtain a license for use and manufacture of laser arrays from the small European company. Note: This technology is yet unproven.
e) Negotiate a purchase agreement from the European company.
g) Negotiate a joint development program with the European company.

3) Work to assure continuing leadership in displays.
a) Negotiate long-term arrangements with Horioka.
b) Negotiate long-term arrangements with Infomatics.

Other Opportunities

Examine the Technology and Policy Toolkit for initiatives for your team to push.

RESOURCES AVAILABLE:

Your team initially has $32M to spend on making deals and investing in Toolkit Options. If funds are spent on toolkit options, a multiplier of 10 is used (a $10M investment in a Toolkit option is worth $100M to you). Additional funds, if needed, must be raised through borrowing from the Japanese Banker or US Financier or receiving funds from other teams. The current price of your stock is $18 per share, with 9,002,800 shares outstanding.

US Government Officials (Legislators, DOC, DOE)

The most challenging roles, and often the most rewarding, are the least structured. Your roles are designed this way. It offers great opportunity for initiatives, some of which may be stimulated by the Toolkit options. Please, never resist the temptation to take initiative.

The US Government's goal is to promote US political, social, military and economic agendas. The ever-increasing budget deficits have severely impacted national spending. The voters are determined to hold taxation and reduce spending. Next year is an election year and Congress is faced with declining manufacturing and rising deficits.

One of the biggest potential markets for SAMSON is in China. However, China has recently had another Tiananmen Square incident. You have significant pressure to impose sanctions from the human rights activists, and pressure from industry to continue Most Favored Nation status.

Jefferson National Laboratory, JNL (a US government lab), has been developing "super capacitors" as possible, long-life, rechargeable power cells for automotive and portable electronics applications. JNL is seeking funding of $50M annually to develop these technologies.

Issues and Policy Options

1) Decide on US Government assistance in creating a US source of intelligent machines for manufacturing through an SBIR grant.

2) Decide on a consortium TRP (Technology Reinvestment Project) to develop a US source of intelligent machines for manufacturing.

3) If asked, decide on allowing or disallowing Infomatics to purchase Mechatronics, or on any company purchasing or being purchased by another company.

4) Provide funding for laboratory development of super capacitors.

5) Provide cost-shared funding for laboratory development of super capacitors with Infomatics.

6) Provide procurement incentives that would create an expansion in intelligent machines production.

7) Review and decide on importing Horioka intelligent machines for the Infomatics purchase.

8) Prepare and present a US proposal for a European-US Free Trade Agreement or US-Japan Free Trade Agreement or both.

9) Establish a more protectionist stance to shield US industry. Import quotas?

10) Revise NAFTA and/or GATT.

11) Continue Most Favored Nation Status with China or impose sanctions.

12) Determine your own options.

Other Opportunities

Examine the Technology and Policy Toolkit to stimulate initiatives to push. Create a Technology Delivery System compatible with your culture.

RESOURCES AVAILABLE:

Your roles initially have in total $400M to spend on making deals and investing in Toolkit Options as follows.

Legislators $125M each
DOE, DOC $ 75M each

If funds are spent on toolkit options, a multiplier of 2 is used (a $50M investment in a Toolkit option is worth $100M to you). Additional funds, if needed, must be raised through borrowing from the US Financier or Japanese Banker.

Japanese Government Officials (MITI, other ministries)

The most challenging roles, and often the most rewarding, are the least structured. Your roles are designed this way. It offers great opportunity for initiatives, some of which may be stimulated by the Toolkit options. Please, never resist the temptation to take initiative.

The Japanese Government team's goal is to promote Japanese political, social, military and economic agendas. The recession is continuing. You are under continuing pressure to expand Japanese markets abroad. However, the US government is becoming increasingly concerned over the widening trade gap. MITI has been forced to reduce expenditures.

A rapidly emerging market for your products is China. However, recent Chinese government policies have human rights activists around the world talking about trade embargoes with China. The US Government is considering revoking Most Favored Nation status. The UN is meeting to talk about trade sanctions. OPEC ministers have been successful in raising crude oil prices by 50%.

Issues and Policy Options

1) Decide on MITI-sponsored low-power CPU development with Horioka.

2) Help develop super capacitors as an alternative to batteries with MITI initiative.

3) Negotiate with US government a mutual interdependency agreement that would stall US initiatives in 3-D displays and intelligent machines for manufacturing.

4) Prepare and present a Japanese proposal for Japan-US Free Trade Agreement or European-Japan Free Trade Agreement or both.

5) Deal with widening trade gap with the US.

6) Establish policy on China.

7) Decide to continue or expand investment in 3-D displays.

8) If asked, decide on allowing or disallowing any company purchasing or being purchased by another company.

9) Discuss your own options.

Other Opportunities

Examine the Technology and Policy Toolkit and the Supplementary Material to stimulate initiatives to push. Create a Technology Delivery System compatible with your culture.

RESOURCES AVAILABLE:

Your roles initially have in total $400M to spend on making deals and investing in Toolkit Options as follows.

MIIB, IPB, MPY, MF	$75M each
ITPB, MFA	$50M each

If funds are spent on toolkit options, a multiplier of 2 is used (a $50M investment in a Toolkit option is worth $100M to you). Additional funds, if needed, must be raised through borrowing from the US Financier or Japanese Banker.

APPENDIX C: GLOSSARY OF TERMS

AI	Artificial Intelligence (for computer programming)
ARPA	Advanced Research Project Agency
ATP	Advanced Technology Program
CAE	Computer-Aided Engineering
CIT (CCIT)	Civilian Industrial Technology Committee, Mary Good, DOC, chair; Martha Krebs, DOE, co-chair. Subcommittees: Automotive Technologies (Mary Good chair), Electronics (Lance Glasser, ARPA), Construction and Building (Richard Wright, NIST, and Arthur Rosenfeld, DOE), Materials Technology (Lyle Schwartz, NIST), Manufacturing Infrastructure (Joseph Bordogna, NSF)
COC	Council on Competitiveness
DRAM	Dynamic Random Access Memory
EC	European Community
ESC	Electronics Subcommittee, Dr. Lance Glasser, ARPA
ESPRIT	A funding agency of the European Community similar to ARPA. All EC countries supply funds to ESPRIT, which then funds research in several areas.
GUI	Graphical User Interfaces
Keiretsu	Japanese business philosophy developed after World War 2 and based on the concept of family relationships; the keiretsu system is an interlocking network of business contacts generally closed to outsiders.
MCC	Microelectronics Computer & Technology Corporation
MEP	Manufacturing Extension Partnership, funded under NIST.
MITI	Japanese Ministry for International Trade and Industry.
MOE	Japanese Ministry of Education, Science, and Culture
NCAICM	National Center for Advanced Information Components Manufacturing, joint ARPA/DOE project; Jim Jorgensen is NCAICM Director
NEC	National Economics Council, Tom Kalil director
NEMI	National Electronics Manufacturing Initiative
NII	National Information Infrastructure
NIST	National Institute of Standards and Technology
NSTC	National Science and Technology Council (replaces FCCSET); newly formed presidential council headed by President Clinton.
NSF	National Science Foundation
OEM	Original Equipment Manufacturer
OIDA	Optoelectronics Industry Development Association, executive director David Cheney
ORD	Office of Research and Development - EPA
OS	Operating System (for computers)
OSPC	PC Operating System (Developed by Infomatics)
OSTP	Office of Science and Technology Policy, headed by John Gibbons
OTA	Office of Technology Assessment
OTP	DOC Office of Technology Policy
PCMCIA	Personal Computer Memory Chip International Association
RF	Radio Frequency
SBIR	Small Business Innovation Research

SEMATECH	Joint industry/government consortium formed in 1987
SIA	Semiconductor Industry Association, US industry formed in 1977
SRC	Semiconductor Research Corporation, SIA's first initiative, formed in 1981.
STTR	Small Business Technology Transfer
Super capacitors	Capacitors with very high energy densities, capable of being recharged in a short time (minutes); a possible high technology alternative to batteries.
TRP	ARPA Technology Reinvestment Project
VLSI	Very Large Scale Integration

STRATEGIES, PRIORITIES, AND REASONING

Name: _____

Role: _____

Strategy: _____

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Priorities: _____

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Reasoning: _____

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